What is claimed is:

1. A method for increasing the yield shear stress of an electrorheological fluid, the method comprising the steps of:

a) applying a sufficient electric field to the electrorheological fluid to cause particles within the electrorheological fluid to form into chains of particles within the electric field; and

b) applying a sufficient pressure to the electrorheological fluid, after step a) and while substantially maintaining the electric field applied in step a), to cause the chains of particles to thicken or aggregate and impart to the electrorheological fluid an increase in the yield shear stress.

2. The method according to claim 1, wherein the pressure in step b) is applied in a direction substantially parallel to the direction of the electric field, thereby shortening and thickening the chains of particles in the electrorheological fluid.

3. The method according to claim 1, wherein the pressure in step b) is applied in a direction substantially perpendicular to the direction of the electric field, thereby aggregating and thickening the chains of particles in the electrorheological fluid.

4. The method according to claim 1, wherein the electric field is applied by applying an electric potential difference between at least one first electrode having a first electric potential and at least one second electrode having a second electric potential.

5. The method according to claim 4, wherein said electric potential difference is applied between one first electrode and a plurality of second electrodes.

6. The method according to claim 4, wherein said electric potential difference is applied between a plurality of first electrodes and a plurality of second electrodes.

7. The method according to claim 1, including an additional step for modulating the yield shear stress of the electrorheological fluid comprising:

c) decreasing or increasing the applied pressure, after step b), to modulate the yield shear stress downwardly or upwardly, respectively; or

d) decreasing or increasing the applied electric field, after step b) to modulate the yield shear stress downwardly or upwardly, respectively; or

e) combining steps c) and d) to modulate the yield shear stress upwardly or downwardly as desired.

8. The method according to claim 7, further comprising a step of removing at least one of the applied electric field and the applied pressure to produce a reduced yield shear stress.

9. The method according to claim 8, wherein the applied electric field is removed to produce a yield shear stress of about 0.

10. The method according to claim 1, wherein the electric field applied in step a) is about 250 V/mm to about 3000 V/mm.

11. The method according to claim 10, wherein the electric field is about 1000 V/mm to about 3000 V/mm.

12. The method according to claim 1, wherein the pressure applied in step b) is about 50 kPa to about 850 kPa.

13. The method according to claim 12, wherein the pressure applied is about 300 kPa to about 800 kPa.

14. An apparatus for increasing the yield shear stress of an electrorheological fluid comprising:

at least one first electrode having a first electric potential;

at least one second electrode having a second electric potential;

a first working structure;

a second working structure; and

an electrorheological fluid positioned between said working structures, said electrorheological fluid being in communication with said first electrode, said second electrode, and said working structures, such that particles within said electrorheological fluid form into chains of particles when a sufficient electric potential difference is applied between said first and said second electrodes, said chains of particles aggregating when a sufficient pressure is applied to said electrorheological fluid while substantially maintaining the applied electric potential difference, to thicken or aggregate said chains of particles.

15. The apparatus of claim 14, adapted to apply said pressure by bringing said working structures closer together.

16. The apparatus of claim 14, wherein said electric potential difference is applied between one first electrode and a plurality of second electrodes.

17. The apparatus of claim 14, wherein said electric potential difference is applied between a plurality of first electrodes and a plurality of second electrodes.

18. The apparatus according to claim 14, including a source of electric voltage sufficient to apply an electric field of about 250 V/mm to about 3000 V/mm.

19. The apparatus according to claim 18, including a source of electric voltage sufficient to apply an electric field of about 1000 V/mm to about 3000 V/mm.

20. The apparatus according to claim 14, wherein the pressure applied is about 50 kPa to about 850 kPa.

21. The apparatus according to claim 20, wherein the pressure is about 300 kPa to about 800 kPa.

22. The apparatus according to claim 14, wherein said electrodes have a linear parallel arrangement.

23. The apparatus according to claim 14, wherein said electrodes have a concentric circular arrangement.

24. The apparatus according to claim 14, wherein said electrodes are arranged in a two-dimensional array.

25. The apparatus according to claim 14, wherein said first electrode is incorporated into said first working structure and said second electrode is incorporated into said second working structure.

26. The apparatus according to claim 14, wherein said first electrode and said second electrode are both incorporated into one of said working structures.

27. The apparatus according to claim 14, wherein said first electrode and said second electrode are both incorporated into each of said working structures.

28. The apparatus according to claim 14, wherein each of said first and said second electrodes is a comb-shaped electrode having teeth, wherein said teeth of said first electrode are intercalated between said teeth of said second electrode.

29. The apparatus according to claim 14, wherein said first electrode and said second electrode comprise substantially all of corresponding inner surfaces of said first and second working structures, respectively.